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A PROSPECTIVE RANDOMIZED TRIAL OF POLYPROPYLENE MESH COMPARED WITH DARN IN INGUINAL HERNIA REPAIR

AT

GOVERTMENT RAJAJI HOSPITAL MADURAI

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CERTIFICATE

This is to certify that the dissertation entitled **"**PROSPECTIVE RANDOMIZED TRIAL OF POLYPROPYLENE MESH COMPARED WITH DARN IN INGUINAL HERNIA REPAIR**"** is a bonafide record of work done by ***Dr. V. THIRULOGA CHANDRAN*** in the Department of General Surgery, Government Rajaji Hospital, Madurai Medical College, Madurai, under my direct guidance and supervision.

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DECLARATION

I ***Dr. V. THIRULOGA CHANDRAN*** declare that I carried out this work on **"**PROSPECTIVE RANDOMIZED TRIAL OF POLYPROPYLENE MESH COMPARED WITH DARN IN INGUINAL HERNIA REPAIR**"** at Department of General Surgery, Government Rajaji Hospital during the period of February 2004 to January 2006. I also declare this bonafide work or a part of this work was not submitted by me or any other for any award, degree, and diploma to any other university, board either in India or abroad.

This is submitted to The Tamilnadu Dr. M. G. R. Medical University, Chennai in partial fulfillment of the rules and regulation for the M. S. Degree examination in General Surgery.

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INTRODUCTION

The Optimal method of providing a durable, low morbidity repair of inguinal hernia remains a matter of contention. The ideal repair should allow the patient rapid return to normal work, leisure and recreation at a reasonable cost to the patient and the wider community.

Since 1887, when Bassini reported his method, over 80 techniques of inguinal hernia repairs are present. Even with finest technique, material and best intentions, a percentage of hernia recurs (6% during the 1st year, 24% over 10yrs duration) because of suturing under tension, natural weakness of tissues.

So, it was realized that some form of reinforcement was needed for the posterior wall of inguinal canal during hernia repair either in the form of nylon darning or polypropylene mesh.

AIMS OF STUDY

Recently many western studies have shown that open tension free mesh repair is the most promising technique of repair of inguinal hernia.

The aim of this study is to compare, two different techniques employed in the treatment of primary inguinal hernia in men, either darning or tension free mesh repair by assessing complications, pain, return to normal activities and early recurrence.

ANATOMY OF INGUINAL CANAL

Inguino – femoral region is a complex boundary between, the abdominal cavity and the lower limb. Its standing position, inguinal area supports the abdominal pressure and is fragilised by the inguinal and femoral orifices.

Fruchaud, in 1956 emphasized that all groin hernias originate within a single weak area – myopectineal orifice – bounded by

- Below – bony margin of pelvis covered by Cooper's Ligament and Pectineus Muscle limited medially by Pubic Tubercle,
- Above – antero – lateral abdominal wall formed by External Oblique (superficially), Internal Oblique and Transversus Abdominius (deep),
- Laterally – Ilio – Psoas Muscle, fascia covering Femoral Vessels,
- Medially – Rectus Abdominis Muscle.

This orifice is divided into two by an aponeurotic structure, the inguinal Ligament into inguinal canal, superiorly, and femoral canal, inferiorly.

The Inguinal canal is an oblique inter – muscular slit of 4cms length, lying above medial half of Inguinal Ligament – commencing at the deep ring and ending at the superficial ring.

- Anterior Wall – External Oblique Aponeurosis assisted laterally by Internal Oblique,

- Posterior Wall – medially by Conjoint Tendon and Transveralis Fascia throughout
- Floor – rolled lower edge of inguinal ligament, enforced medially by Lacunar ligament.
- Roof – lower edge of Internal Oblique and transverse Abdominis muscles.

Structures passing through the Inguinal Canal

A. Spermatic Cord – in males, this contains,
    i. Vas Deferens and its Artery
    ii. Testicular Artery, Pampiniform plexus of veins,
    iii. Remnants of Processus Vaginalis
    iv. Genital Branch of Genito – femoral Nerve,
    v. Autonomic nerves and lymphatics,

Triangle of Hasselbach-

Bounded laterally by inferior epigastric vessels,

Medially by lateral border of rectus abdominis

Inferiorly below by inguinal ligament

ETIOLOGY AND PATHOPHYSIOLOGY

1) PRIMARY HERNIA

    a. Evolution

    b. Patent process vaginalis

    c. Failure of shutter mechanism

    d. Raised intra – abdominal pressure

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1) PRIMARY GROIN HERNIA:

1.1) EVOLUTION

Groin hernias all share the common feature of emerging through the myopectenial orifice of ‘Fruchaud’ the opening in the anterior abdominal wall bounded above by the myoaponeurotic arch of the lower edges of the internal oblique and transverses abdominals muscle (conjoint tendon) and below by the pectineal line of the superior public ramus. The space is arbitrarily divided in to two parts by the lower edge of inguinal ligament and is closed of posteriorly by fascia transversalis only.

This unfortunate evolutionary defect in human beings, the absence of posterior rectus sheath below arcuate line and only rather a insubstantial transversalis fascia unsupported by muscle or aponeurosis resisting the intra-abdominal pressure and holding the breach between the abdomen and the thigh – is compounded by human appearing the upright position and change from quadripedal to bipedal locomotion. In human, upright posture causes the gravitational stress to pass down to the lower abdominal wall, which is structurally is not designed for it, nor has evolution suited it for its new role. This may be a significant factor causing weakness of transversalis fascia and the development of groin hernia. The factors that bring about failure of the T. Fascia is less than 5% of human and those that ensure its permanent integrity in

the others are the issues that must be addressed when considering the etiology and pathophysiology of groin hernias.

Causes of groin hernia is multi factorial, one or more factors applying in any particular case.

1.2) Patent processus vaginalis:

A patent process vaginalis is the prime cause of indirect inguinal hernia in children whom it is cured by simple ligation at the internal ring – herniotomy. The same holds good for adults but additional etiological factors also play a role in them. The mechanism underlying closure of the processus vaginalis is unknown. Hughson found patent processes vaginalis in 20% of adult autopsy examinations, yet none of the subjects suffered from hernia during life. Therefore, additional factors must be present to produce an indirect hernia when a patent processus vaginalis is present.

1.3) Failure of shutter mechanism:

Coughing, straining, lifting of heavy weights and other normal daily activities generate extremely high intra abdominal pressures, yet the natural weaknesses of the groin such as the internal inguinal ring and the T. fascia, maintain their integrity in the over whelming majority of individuals and even in those with an open internal inguinal ring and a patent processus vaginalis.

The accepted explanation for this is the physiological “shutter mechanism”: which is activated abdominal muscles contract and cause intra

abdominal pressure to increase when performing these function. Contractions of the transverses abdominis muscle also pulls up and tenses the crura of the internal ring, causing the ring to close. External oblique muscle on contraction presses against the internal ring as well it pulls up the inguinal ligament to make it convex cranially. The very act of contraction of the abdominal muscles in coughing and straining, which tends to blow out the internal ring and the fascia transversalis automatically and exactly brings into play mechanisms that resist this damage.

1.4 Raised intra abdominal pressure:

Cough, prostatism, constipation, pregnancy, obesity, and unusual exertion, especially heavy lifting do not cause groin hernia by its own. However when intra abdominal pressure rises passively and abdominal muscles are relaxed, above defense mechanisms are not activated so F. transversalis is left on its own to withstand increased intra abdominal pressure. If a patent processes vaginalis is present, or if the F. transversalis is not sufficiently strong or become attenuated by prolonged pressure and stretching it gives way and a direct or an indirect hernia develops. This situation is seen in pregnancy, chronic ascites. Ventriculo – peritoneal shunting and peritoneal dialysis. Groin hernias especially direct inguinal hernia, are more common in men over the age of 50 years. In elderly men, in whom the aging process and stress of life have weakened the muscles, the shutter mechanics, and the fascia Transversalis, only

a moderate effort seems to be sufficient to suddenly produce a groin hernia, indirect through a pre existing patent processes vaginalis 0r aging direct hernia simply stretch and balloon out the attenuated F. transversalis infront of it.

1.5) Failure of integrity of the fascia transversalis:

Collagen:

The fascia transversalis at its best is not a very strong layer of the abdominal wall .The fascia may be attenuated by factors that interfere with normal production of collagen or cause its increased destruction or the production of abnormal collagen fibers. These factors include connective tissue disorders such as Marfans, Ehlers-Danlos and Hurler-Hunter syndromes and certain mesenchymal metabolic defects causing deficiency and or structural abnormalities of collagen. Heredity also plays a role in the development of groin hernias.

Cigarette smoking:

The free, unbound and active protease and elastase compounds are found in the serum of smokers, apparently by the increased number of circulating WBCs in the lungs of smokers. These circulating unopposed enzymes upset the protease – anti protease balance in the blood and bring about destruction of elastin and collagen of the rectus sheath and F. transversalis and cause their attenuation and predisposes to herniation in cigarette smokers.

1.6) General Factors:

The ability of the abdominal wall in the groin to withstand the forces in favor of herniation may be reduced by the weakening of the muscles and fascia with advancing age; lack of physical exercise; adiposity; multiple pregnancy; loss of weight and body fitness as may occur after illness, operation or prolonged bed rest. Certain operations in the lower abdomen, which cut through the myoaponeurotic arch or cutting across the motor or sensory nerves of the groin cause atrophy of the muscles. The incidence of groin hernia is same in sedentary workers as in heavy manual labourers, indicating that strenuous physical activity alone does not cause hernia, however it brings about a rise in intra abdominal pressure and so may cause an existing small and unnoticed groin hernia to expand and become more obvious.

2. Recurrent groin hernia:

Most recurrence appears within 2 to 3 years of primary repair. This early group of recurrences is mainly caused by failure on the part of surgeon and by infection. Those appearing after this time and even many years later make up the smaller group commonly blamed on tissue failure.

2.1) Early recurrence

a) Experience of the surgeon: Recurrence rate decreases with surgeon's experience. Specialization decreases it to less than 0.12%.

b) The approximation of tissues under tension is a cardinal, if not the most important factor in the failure of a hernia repair. Tissue pulling of the suture creates an area of ischemic pressure necrosis where suture meets the tissue. This process of necrosis progresses until there is no longer any tension, which usually occurs when tissues have returned to their previous unsutured position and hernia recurs through the resultant gap. The same mechanism applies in repair of recurrent hernias in which tissues are scarred and unyielding. Tension is also responsible for the high rate of recurrence of femoral hernia, and for common ‘diverticular’ or ‘punched’ out direct recurrent hernia, which protrudes through a localized defect in the reconstructed posterior wall of the inguinal canal. The highly successful tension free repairs are based on absolute absence of tension.

C: **Infection:** This is the most serious complication of repair of groin hernias. It has been estimated that 50% of recurrences are caused by infection. One third or more of infected groin hernia repairs result in recurrent hernias. Mild redness of the skin edges or a small clear serous discharge or a localized stitch abscess does not influence recurrence rate. However frank, acute cellulites in and around the wound may progress to facilitate necrosis of the tissues and to deep abscess formation with purulent discharge from the open wound. Even without any evidence of infection, a chronic deep seated, low-grade inflammatory

process may be present because of organisms introduced at the time of the operation.

Where non absorbable suture materials are used the suture material maintain their strength but the weakened edematous and inflamed issues are unable to hold the sutures against the stresses and strains to which the wound is subjected, so sutures tear the tissues and cut out. The inflammation and edema of tissues brought by infection cause them to swell, so that a larger volume of tissue is enclosed within the unyielding ring of the suture leading to pressure necrosis of the tissues. The final result is that, even though wound may heal and the sinuses close, the sutures no longer give the vital support to the tissues. The repair heals with scar tissue that is unable to withstand the stress of the rise and fall of the intra-abdominal pressure and finally gives way to a recurrent groin hernia.

d) The suture material:

The process of healing of groin hernia takes approximately one year. It involves the production of collagen and its maturation and remodeling so that fibers lie in parallel bundles according to the lines of stress. By in the end of sixth month the wound has gained 80% of its final strength. Therefore it is apparent that wound must be supported for at least this time. Any suture material that will not hold the tissues for at least 6 months is unsuitable for hernia repair. Mono filament stainless steal wire is inert, causes little tissue

reaction, remains intact, retains it strength almost indefinitely and is therefore ideal suture material for inguinal hernia repair. But most surgeons prefer using monofilament polyamide or polypropylene suture material. They are strong, smooth and inert and excite very little tissue reaction. The risk taken in using absorbable suture material in hernia repairs unreasonable.

e) Suturing technique:

The mass suture technique has been a great advantage in the prevention of recurrent inguinal hernias. Continued suturing techniques have a greater wound bursting pressure than simple interrupted methods. It gives a better distribution of tension along the entire length of approximated tissue. With interrupted technique tension is focused on each individual stitch so that dehiscence begins at the stitch where the tension exceeds suture – holding capacity of the tissue. The Shouldice Hospital has always stressed the importance of using a continuous suture and taking large bites of tissues with each suture.

f) General factors for the cause of early recurrence:

Age: Prematurity in infants does increase the recurrence rate. Recurrence rate is actually low in older age group repairs.

Side : No evidence to suggest either side is prone to recurrences.

Gender : No influence

Anaesthesia : No influence on recurrence rate.

General condition : Poor state of health as in malnutrition, hypoproteinemia, vitamin deficiency, jaundice, prolonged infection, malignant disease influence wound healing and collagen production.

- **Body weight :** No definite relationship has been found.
- **Smoking :** A higher percentage of smokers than non smokers develop groin hernias and recurrences.
- **Cough :** minimal independent evidence to show association.
- **Prostatism :** No casual association.
- **Ascites :** Increased intra abdominal pressure in the form of ascites is a potent etiological factor in the development of groin hernia.
- **Growth factors:** Naturally occurring growth factors and immuno – modulators stimulate angiogenesis and granulation tissue formation; fibroblast production; and collagen production; and increase in the breaking strength of wound. All patients in the future undergoing hernia repair may be given these factors to eliminate recurrences.
- **Metabolic defects:** The mesenchymal and connective tissue disorders case disproportionate incidence of primary and recurrent hernias. These patients require large sheets of prosthetic mesh.

g) Local factors for early recurrence:

- **Repeated repairs:** The defect grows larger with each repair and tissues become progressively stiff and unyielding. Attempts at approximating the almost solid edges of the defect under tension only lead to further tissue necrosis and another recurrence.

- **Femoral hernia:** Lotheissen approach damages the shutter mechanism and fascia Transversalis. Failure to repair them an lead to recurrent inguinal hernia.

- **Size of the hernia:** Large hernias recur twice as common than smaller ones. Stretching cause attenuation and destruction of tissues normally used for repair of hernia.

- **Emergency repair:** Strangulated hernia repair in infants and children is followed by higher rate of recurrence. Internal ring will be widely dilated and the tissues are friable and easily torn. In adults available results show little difference.

- **Skin preparation:** In obese and large hernia patients, infected dermatitis is often present in the deep folds around the hernia. Effort should be made to clean up this before operation especially in prosthetic implantation.

- **The incision:** Should be adequately long to expose both the medial angle and laterally for the internal ring. Raising skin flaps is not necessary.

- **The cremaster:** The muscle should be completely excised failure of which is associated with a higher recurrence rate.

- **Missed hernias:** In the course of repairing a direct hernia, the cord must be explored for the presence of an indirect sac, or small protrusion of peritoneal sac through the internal ring. Herniation of the preperitonial fat through the conjoint tendon must be excised and the opening carefully sutured to avoid later recurrent direct hernias.

- **Femoral canal:** It must be examined when repairing an inguinal hernia.

- **The hernial sac:** High ligation and excision of the sac do not influence the recurrence rate, may be a case of increased postoperative pain, and are unnecessary. Short sacs can be simply replaced in to abdominal cavity. Longer sacs can be transected and freed in to abdominal cavity without suture of ligature peritoneal defects heal within hours or days.
- **The internal ring:** Inadequate reconstruction of the internal ring and failure to thin out the cord and to close the ring snugly around it leaves a gap through which a recurrent indirect inguinal hernia may appear.

- **Posterior wall buttress:** In children there is no need to interfere with the posterior wall. While in adults a procedure to buttress the posterior wall is must regardless of type of hernia. Failure to strengthen the posterior wall causes hernias to recur because of factors beyond the control of surgeon, such as the aging, scar tissue and disturbed collagen metabolism. Medial recurrence when buttress has not made sufficiently medial in to the pubic tubercle and beyond or medial angle is closed under tension.

- **Type of repair:** Best method is the one that the surgeon knows well and does best. **THE SKILL AND THE EXPERIENCE OF THE SURGEON ARE MORE IMPORTANT THAN THE TYPE OF REPAIR.**

- **Orchiectomy:** This should not be done for the reason of decreasing the recurrence rate.

- **Drains :** Should not be routinely used in standard hernia repair. Postoperative suction drain can significantly reduce the incidence of wound hematoma, seroma, and infection following repair of large hernias. The drain should be selectively brought out through a separate

stab incision and removed after 24 hours or as soon as possible to avoid retrograde infection.

- **Early mobilization:** Persons with sedentary occupations suffer double the number of recurrences as those performing heavy manual labour. Early mobilization and post operative convalescence time have no influence on recurrence rate

- **Bilateral repairs :** Does not raise the recurrence but it is safe to defer the second side if the first side is very large, difficult, prolonged or involves more dissection than usual.

- **Combined procedures:** Unilateral or bilateral hernia repair can be combined with almost any procedure without influencing the recurrence rate.

2.2. Late Recurrence:

The incidence of recurrent hernia tapers off after the first five years. Basic mechanism of late recurrence is not known. Aging of the tissues,

weakening of the muscles and loss of body vigor are advanced as the reasons for the late recurrence.

2.3) Prosthetic mesh and recurrent hernia:

Absolute mesh has no role in hernia repair. The sheet of mesh should be sufficiently large to overlap the hernial defect with an apron of at least few centimeters so as to allow a wide area for incorporating and fixation of mesh. The fixing sutures and staples must be placed in good, strong tissues as far from the weakened tissue around the hernial opening as possible. The deeper the level of the mesh, the less likely the recurrence of the hernia.

THE IDEAL PROSTHESIS

Hernioplasty:

A) Autologous material

a. Fascia lata

b. External oblique aponeurosis

c. Anterior rectus sheath

d. Skin flap

B) Heterogenous

a. Polyester

b. Polypropylene

c. E-PTFE mesh

d. Stainless wire

Some conclusions can be drawn form the current accumulation of data, but it is doubtful that we have as yet seen, atleast in any currently available from, the ‘ideal prosthesis’. In 1950, Cumberland and Scales developed eight still pertinent criteria for the ideal implantable biomaterial. The material should

- Not be physically modified by tissues
- Be chemically inert
- Not excite an inflammatory or foreign body reaction
- Be non carcinogenic
- Not produce a state of allergy or hypersensitivity
- Be capable of resisting mechanical strains
- Be capable of being fabricated in the form required

- Be capable of being sterilized

Three biomaterials currently in widespread use throughout the world in hernia repair are well tolerated by the body

- Polyester mesh
- Polypropylenes mesh
- e-PTFE patch.

From a clinical perspective all of these biomaterials have all been shown, both macroscopically, and microscopically, to allow tissue in growth in to the prosthesis. The more coarse macro porous mesh clearly differ from the smooth micro porous e-PTFE patch in this regard.

The polypropylene and the polyester meshes incite a more proliferate, although disorganized, fibrous collagenous response that may feel creates a more secure bond with the surrounding fascia.

The ultimate success with any of these three commonly used biomaterials must rely on the health of the surrounding fascia to which the prosthesis must be securely sutured, without undue tension. The only prosthetic material that seems to elicit a strong, orderly and organized collagen response, aligned in the direction of the stress applied, is the carbon fiber material which has had little clinical use reported.

Future biomaterials must meet three additional criteria to more nearly match the Cumberland and Scales requirements for the ideal prosthetic material:

- They must be resistant to infection
- They should provide a barrier to adhesions of the material placed adjacent to viscera.
- They must respond in vivo like autologous tissue.

Adherence of bacteria to prosthetic material is the initial step in the pathogenesis of prosthesis colonization. Impregnation of broad spectrum antimicrobials, such as silver and chlorhexidine into implantable devices has been shown to reduce bacterial colonization. Systemic antibiotics often fail to prevent patch infections clinically because the drugs cannot penetrate the bacterial bio film that forms on the surface of the prosthesis. Impregnation of silver and chlorhexidine in to the e-PTFE patch appears to prevent bacterial colonization and subsequent infection.

Thus it seems that an antimicrobial impregnated prosthesis that allows well – organized fibrous in – growth on one side and has anti- adhesion properties on the other side would approach the brass ring of an ideal prosthetic material for the abdominal wall reconstruction.

COMPLICATIONS OF GROIN HERNIA

SURGERY

A) ANESTHESIA

B) SURGERY

1. **TESTICLE**
2. **VAS DEFERENS**
3. **LYMPHATICS**
4. **VESSELS**
5. **NERVES**
6. **VISCERAL**
7. **BONE**
8. **SKIN**

C) PROSTHESIS RELATED

D) RECURRENCES

E) LAPAROSCOPIC COMPLICATIONS

A) ANAESTHESIA

Anesthesia complications

Relevant to the safety of hernia surgery local anaesthesia is the widely used for anesthesia. Epinephrine is never included with the local anesthetic agents because it may precipitate substantial tightness, palpitation, elevated blood pressure and tachycardia.

Epinephrine “reversal” has also been documented and is manifested by hypertension, hyperventilation and shock. We do not have much experience with local anesthesia in hernia surgery. **In elective surgery majority of**

cases we did were by spinal anesthesia and its main complications were urinary retention and spinal head ache.

B) COMPLICATIONS DUE TO SURGERY

1) Testicle

The two pertinent complications concerning the testicle are ischemic orchitis and testicular atrophy. Clinical manifestations occur within 24 to 72 hours, namely, painful enlargement of the testicle (two to three time's normal size) woody hard in consistency associated with a low-grade fever. At the fever may precede physical findings for 24 to 72 hours. The pain associated with ischemic orchitis is severe and may last up to 6 weeks, requiring aggressive and effective analgesia. Ischemic orchitis may progress and result in testicular atrophy, process that may be observed over several months.

The mechanism of ischemic orchitis finds its best evidence form Fruchaud and Wantz and stems from an intense venous congestion within the testicle secondary to thrombosis of these veins within the spermatic cord. The initiating trauma is seen during dissection of the cord from the hernial sac, whether direct or indirect.

2) Vas Deferens

Trauma to vas deferens can be one of transection or obstruction. Transection is a mishap that usually occurs through open repairs,

particularly in recurrent herniorrhaphies. Reanastomosis should be attempted with 0 Prolene as a stent, which can be pulled out after 3 days. Transection can, however occur with all techniques. Obstruction can results from handling of the vas with forceps, yielding a fibrosis of varying severity through the muscular wall of the vas.

3) Lymphatics

Hydroceles complicating inguinal hernia repair have been reported to be 0.7% following 14, 442 operations. The overzealous skeletonisation of the spermatic cord is the most probable cause. In the groin, seroma are seldom significant or clinically noticeable, in contradiction to incisional hernias. It will take 6 to 8 weeks to relapse before needling and draining seromas are tried.

4) Vessels (Arteries and Veins)

Superficially, subcutaneous hematoma or severe ecchymosis can result from careless ties or cautery to the superficial vessels. On a deeper plane, during resection of the cremaster, careless ligature of the external spermatic artery can result in a tense hematoma and ecchymosis that extent to the scrotum. Division of T.Fascia requires attention at its medial edge of the deep inguinal ring to avoid laceration of the deep inferior epigastric vessels.

Within the space of Bogros, a venous circulation is present and can be the source of brisk bleeding. Less commonly an iliopublic artery is present.

The presence of an aberrant obturator artery originating from the deep inferior epigastric artery can be the source of bleeding when blind sutures are inserted in the ligament of cooper without the T.fascia or when the lacunar ligament is incised.

Injuries to the femoral vein may be caused by suture of the anterior wall of the vein during inclusion of the shelving edge of the Poupart's ligament in the repair or by the compression of the femoral vein by a suture that is placed too laterally on the ligament of Cooper. All control of bleeding must be done under direct vision. Other minor complications but not uncommon, are thrombophlebitis of the dorsal vein of the penis and thrombosis of the superficial ascending inferior epigastric vein.

5) Nerves: Residual neuralgia following Herniorrhaphy represents the most vexing complication of the inguinal region. Essential to understanding the neuralgia is the recognition that the anatomy of the illioinguinal, illio-hypogastic, and genito-femoral nerves displays a marked variation that is seldom realized.

Chevrel has described four types of neuralgia.

- **Neuroma pain :** The most common type, caused by proliferation of nerve fibers outside the neurilemma following complete or partial nerve section. Hyperesthesia is seen along the corresponding dermatome. Pain is exquisite at the site of the Neuroma and simulates an electric shock.

- **De-afferentation pain:** A burning pain following partial on complete nerve section or entrapment in a ligature with chronic paroxysmal exacerbation. Initially, adjacent areas of hyperesthesia and contact dysesthesis in the corresponding dermatome follow an area of anesthesia.
- **Projected pain:** the intact nerve is encased in a callus or entrapped in a ligature. Pain is elicited by light touch along the course of the nerve.
- **Referred pain:** The lesion is at a distance such as inflammatory granuloma around a suture or the stump of a peritoneal sac
- In many cases, the pain can be undoubtedly debilitating, and to that end, re-exploration of the wound and division of the three nerves is desirable. Resection of genital branch of genitofemoral nerve, of course, is done during the course of Shouldice repair. In women, the genital branch of genito– femoral nerve should be preserved because it is the sensory nerve to the labium majus.

6) VISCERAL:

Urinary bladder: The bladder is posterior and medial to the posterior inguinal wall and may be adherent or slide in to a direct of femoral hernia. Recognition of the injury and repair in two layers will correct complications.

Bowel: Complications relating to bowel during open techniques of hernia repairs are limited to two situations.

1. The freeing of an incarcerated or strangulated segment of bowel.
2. Inadvertent laceration of large bowel in the presence of a sliding hernia.

Laparoscopic hernia repair complications include laceration of the bowels, trocar site herniation with a Richter's type of herniation, adhesion of viscus to mesh with resulting ileus, obstruction, adhesion formation, erosion and transmigration of mesh. Internal herniation has been reported secondary to failure of peritoneum to remain sutured for stapled (***"shower curtain effect"***) – clinical presentation is one of the acute bowel obstructions. If hernia is waited to become too large, danger lies in the great rise in intra abdominal pressure following repair and its resultant respiratory complication.

7) BONE:

Osteitis pubis as a complication of hernia repair seems to have disappeared with the eliminations through the periostium. However the generous use of staples may causes the resurgence of the same problem.

8) SKIN:

Infection: Presence of a drain and length of its presence increases infection by a factor of nine. Increased, recurrent, umbilical and femoral hernias also showed increase in infection rate. Duration of surgery was also a

significant factor. Brained yarns contain microscopic interslices 1x2 micrometer in diameter, which keep out macrophages (10 micro meter). Gore Tex also consists of pores smaller than macrophages, the reason for which it must be removed when it becomes infected. Infection with polypropylene and polyester mesh does not imply its removal unless mesh is bathed in purulent exudates. In shouldice hospital out of the 3000 mesh operations only two cases needed mesh removal. The presence of infection, contamination at surgery generally precludes use of prosthesis. There was no significance in the routine use of prophylactic antibiotics in mesh repairs.

C) PROSTHESIS RELATED COMPLCIATIONS

- Major complications manifest in the presence of infection or when in proximity to viscus.
- Not prosthetic appliance, however sophisticated, can supplant a good knowledge of anatomy.
- Because meshes are inhabited by fibroblasts and will fibroses, they reveal rigidity and buckling that is often felt by the patients.
- Because of the permeating fibrosis in to the mesh, which contracts and results in 20% shrinkage of mesh, prosthesis should never be laid taut.
- Contact of mesh with severed nerve ends created a typical late onset postoperative pain.
- All prostheses form adhesions. Gore – Tex probably forms the least.

- There is no convincing evidence showing carcinogenicity of any of the prosthesis the past 40 years.

D) RECURRENCES:

Ironically, recurrences remain the most common complication of hernia surgery and range form 2.3% to 20% for inguinal hernias and form 11.8% to 75% for femoral hernias.

Anatomy : Division of the floor of the canal allows not only adequate examination of the floor but also exposure of the proper myoaponeurotic layers necessary for a good repair, and this step is often omitted in open groin repairs.

Experience of the surgeon: Surgeons limiting their practice of hernia surgery shows better results.

Corruption: It is common error done by many surgeons. No one does a classical Bassini, a Shouldice, or a Stoppa. Instead do a modified Bassini, modified Shouldice, or a modified stoppa.

Pathology: Herniation must be considered end result of a collagen deficiency, the so-called metastatic emphysema of Read, so repair must encompass areas beyond the immediate defect (children excluded).

Misuse of prosthesis: Some of the causes of recurrences include a mesh size that is to wall, staple misplacement, inadequate placement of mesh, and rolling of mesh. The most remarkable results form the use of prosthetic materials has been noted in femoral herniorrhaphies, primaries and recurrences.

E) LAPAROSCOPIC CONSIDERATIONS:

Specific complications include pneumothorax, hypercarbia and peritoneal traction, which may result in cardiac arrhythmia. Some contraindications to Laparoscopic surgery include severe cardiac or pulmonary disease, extremes in age, the nature and extent of previous operations, incarceration or strangulation, sliding inguinal hernia, scrotal hernias, bleeding diathesis and ascites. Recurrences from Laparoscopic repairs are best repaired by open approach.

CLASSIFICATION SYSTEMS OF GROIN HERNIAS

The once simple division of groin hernias into direct and indirect inguinal and femoral components is no longer adequate to reflect a more sophisticated understanding of the pathophysiology and management of these lesions. Similarly, the availability of a concise easy to use, logical and recognizable classification scheme would facilitate a better understanding of modern repair techniques and confirmation of operation results. As a communication tool, the routine use of a well recognized hernia classification scheme would make the retrieving and reporting of treatment results more

comprehensive, meaningful, and reliable. On a practical level, an acceptable nomenclature would assist health care planners to better understand the political, economical, the sociologic implication of performing one type of Herniorrhaphy more than another.

Over the past 4 decades attempts to classify groin hernias, with regard to both their functional anatomy and surgical management has been pursued. Much has been written concerning classification schemes and the concept of ‘individualization of hernia repair’. Although a laudable goal the pre prosthetic era of hernia repairs, such thinking is outmoded in the “tensionless age”. What present day classification systems should foster are not individualization of hernia repair but rather the evaluation of differing surgical procedures by comparing their results in homogenous groups (i.e., similar hernia type) of patients.

GILBERT CLASSIFICATION WITH ADDITIONS BY RUTKOW AND ROBBINS

In 1988, Gilbert described a detailed classification system based on anatomic and functional defect established intra operatively, namely presence or absence of a hernia sac, the size and competency of internal right, the integrity of transversalis fascia Transverses Abdominis layer (posterior wall) within Hasselbach’s triangle. Incorporating these three components, Gilbert

categorized groin hernias into 5 classes : types 1,2, and 3 were indirect, where as type 4 and 5 were direct.

- **Type 1** has a tight internal ring through which passes a peritoneal sac of any size. When this sac is surgically reduced, it will be held within the abdominal cavity by the intact internal ring.

- **Type 2** has a moderately enlarged internal ring that measures not more than 4cm.

- **Type 3** has a patulous internal ring more than 4 cm, with sac frequently having a sliding or scrotal component that usually impinges on the direct space, including displacement of epigastric vessels.
- **Type 4,** essentially the entire floor of the inguinal canal is defective, although the ring is sound.

- **Type 5** consists of a direct diverticular defect of not more than 1 or 2 cm in diameter, usually in a supra – public position but found anywhere on the posterior wall.

In 1993, **Rutkow and Robbins** expanded on Gilbert's classification scheme.

- **Type 6** was added to encompass those groin hernias consisting of both indirect and direct components (Pantaloon hernias).

- **Type 7** covers all femoral hernias. As with any classification system, numerous variations and combinations must be accounted for. Therefore, these variables (i.e., primary versus recurrence, reducible versus incarcerated versus strangulated, sliding component, or lipoma) must be individually noted in describing any hernia type.

For types I, II and III the indirect sac is dissected free to the level of the internal ring, along with any lipoma of the cord. The sac is rarely opened, except in cases of incarcerated hernia. Hence, sacs do not need to be ligated. The freely dissected sac and any adjacent lipoma are allowed to drop back through the internal ring into the abdominal cavity.

A hernia plug is inserted tapered end first through the internal ring and placed into position just beneath the crura. Type I hernia repair maintain the plug in position by placing one or two interrupted sutures through the mesh and the crura. In types II and III hernias the plug should always be secured to the margins of the internal orifice with multiple interrupted sutures.

In types IV, V hernias the fusiform and saccular direct defect is circumscribed with elector – cautery to reveal preperitoneal fat and areolar tissue. This provides a visible margin of atleast 5 mm of surrounding intact tissue with which to secure the plug. The freed sac and overlying attenuated

fascia transversalis, Transverses Abdominis aponeurosis layer are invaginated. The plug is inserted narrow end first through the floor defect, and interrupted sutures are used to secure the device in permanent position.

For type VI or pantaloon hernias two or even more plugs have been placed successfully.

All direct and indirect Herniorrhaphy are reinforced with a second piece of flat Marlex mesh. This on lay patch is placed with suture less technique on the anterior surface of the posterior wall of the inguinal canal form the public tubercle to above the internal ring. It is important to understand that the onlay piece of mesh is intended solely to strengthen the direct space and is not an integral part of the current repair of hernia.

Type VII or femoral hernia an infra inguinal approach is utilized. Adhesions between the hernial sac and surrounding tissues are freed. The sac remains unopened from out side in through the femoral canal and hernia plug is placed through the opening of the femoral canal. After proper poisoning, the plug is secured by interrupted sutures to the surrounding fascia or other tissue. An onlay patch is usually not necessary in completing repair of a type VII hernia.

NYHUS CASSIFICATION

In 1991, Nyhus introduced a classification scheme based on strict anatomic criteria, focusing on the functional state of the internal ring and posterior wall of the inguinal canal.

- **Type I:** Indirect inguinal hernia in which the internal ring is of normal size, configuration and structure. The hernial sac can extend form just distal to the internal ring to the middle of the inguinal canal, but the area of the Hasslbach's triangles remains normal.
- **Type II:** Indirect, inguinal hernias in which the internal ring are attenuated but do not impinge on the floor of the inguinal canal.
- **Type III** Hernias consist of three sub types (direct, indirect and femoral) and always represent loss of posterior wall integrity.
    - **Type III A : direct inguinal hernias**
    - **Type IIIB : Indirect inguinal hernias**
    - **Type IIIC : Femoral hernias.**
- **Type IV :** recurrent defects
    - **Type IVA :** direct
    - **Type IVB :** Indirect
    - **Type IVC :**femoral
    - **Type IVD :** combination of these

BENDAVID CLASSIFICATION

In 1993, Bendavid proposed the type, staging and dimension (TSD) classification scheme. Five types of groin hernias are described:

- **Type 1** : Indirect or antero – lateral
- **Type 2** : Antero medial or direct
- **Type 3** : Postero – medial or femoral
- **Type 4** : Postero – lateral or prevascular
- **Type 5** : antero – posterior or inguino – femoral

Type 1:

- **Stage 1:** extends from the deep inguinal ring to the superficial inguinal ring
- **Stage 2:** goes beyond the superficial ring but not into the scrotum
- **Stage 3:** reaches into the scrotum

Type 2:

- **Stage 1:** remains within the confines of the inguinal canal
- **Stage 2:** goes be goes beyond the superficial ring but not into the scrotum
- **Stage 3:** reaches into the scrotum

Type 3

- **Stage 1:** occupies a portion of the distance between the femoral vein and the lacunar ligament
- **Stage 2:** goes the entire distance between the femoral vein and the lacunar ligament
- **Stage 3:** extends from the femoral vein to the pubic tubercle (recurrences or destruction of lacunar ligaments)

Type 4

- **Stage 1:** located medial to the femoral vein
- **Stage 2:** located at ht level of the femoral vessels
- **Stage 3:** located lateral to the femoral vessels

Types 5

- **Stage 1:** has lifted or destroyed a portion of the inguinal ligament between the public crest and the femoral vein
- **Stage 2:** has lifted or destroyed the inguinal ligament from the pubic point lateral to femoral vein

In the TSD classification plan, the “D” refers to the diameter of the hernial defect at the level of abdominal wall. There is a series of sub classifications for type 2 hernias with the letters “m”,l “c” or “e” denoting whether a defect located through the medial, lateral, central, or entire portion of the posterior wall of the inguinal canal respectively.

Bend avid does not individualize the TSD classification scheme to a specific operative repair. Instead, at the Should ice hospital, where he operates, a standardized four layer, tissue based Herniorrhaphy is usually completed regardless of the type, Stage, or dimension.

STOPPA CLASSIFICATION

It is the latest groin hernia classification system, with special attention given to so – called “aggravating factors”. Inherent to this classification is an emphasis that every hernia should be considered and treated individually.

Of the four classification systems presented, Gilbert with additions by Rutkow and Robbins remains the most practical and applicable.

Bendavid’s TSD scheme provides the greatest amount of clinical information but is too unwieldy to be used by the average surgeon on an every day basis.

Those on Nyhus and Stoppas are based on the concept of individualization and prosthetic based hernia surgery.

Still, it is important to understand that the challenge of classifying groin hernias has been entirely nor satisfactorily met. Each scheme has its own particular shortcomings, invariably caused by unknown hernias that cannot be classified or a rarely seen anatomic variant. Regardless, surgeons who wish to report their Herniorrhaphy techniques should at least begin to use one of these

classification plans to facilitate the objective evaluation of repair technique and permit a more honest verification of the results.

MATERIALS AND METHODS

This study was conducted at Government Rajaji Hospital, Madurai, by inviting the male patients of age more than 20 years with inguinal hernia. After getting informed written consent, they were randomized to either group by allocating random numbers.

Exclusion criteria

- Emergency surgery for obstructed or strangulated hernia,

- Incarcerated or irreducible hernia,
- Inability to speak,
- History of dementia or psychiatric illness,
- Refusal to give consent,
- Unfit for general anaesthesia,
- Recurrent inguinal hernia,
- Huge hernia,

A total of 62 patients were included in this study performed for 2004 to 2006

HERNIA REPAIR

Hernia Operation:

Operation was undertaken by one of the four surgeons or their postgraduate trainees form one surgical unit in the hospital

All the patients were admitted at least the day before surgery. A minimum six hours of fasting was advised. Preparation of skin including

shaving was done one hour before surgery. Prophylactic antibiotics were used preoperatively.

All cases were done under spinal or epidural anesthesia.

Operative techniques:

Initial dissection: A transverse skin crease incision put two centimeters above and parallel to medial two thirds of inguinal ligament, deepened down to external oblique aponeurosis. Inguinal canal opened by opening external oblique aponeurosis in the direction of its fibers.

***Hernial sac*:** Direct sacs be inverted and imbricate using 1—0 prolene to flatten the posterior wall. Indirect sac if dissected form the cord up to extra peritoneal fat and excised after ligating at the neck using 2-0 chromic catgut. High dissection, rather than low dissections is the important feature at this stage. If inguinal ring is widened (Gilbert's classification II or III) ring is narrowed by Lytle's method. Inguino scrotal sac is transected in the canal and proximal part dealt as before and distal part left undissected but wide open.

The posterior wall strengthening done using either onlay tension free mesh or by darning using 1 prolene.

ONLAY MESH REPAIR

The posterior wall is covered by an appropriate size and shape of poly propylene mesh onlay (6 x 10cms) slit longitudinally pathway from lateral to medial to give a one third lower leaf and two third upper leaves. It must be sufficiently wide enough to ensure that it can be tucked well up under superior leaf of external oblique and its lower edge overlaps inguinal ligament. The infero medial corner of the mesh is sutured to soft tissue overlying the pubic

tubercle using polypropylene suture. It is critically important to obtain a two or three centimeters overlap here.

Inferior border of mesh is fixed to inguinal ligament with loose continuous suture, and the superior edge is similarly attached high up under the superior leaf of external oblique aponeurosis. One or few stitches are used where the tails of the mesh cross lateral to the cord and are placed to ensure a snug fit around the cord. Wound is closed in routine fashion after putting the cord structures over the mesh.

Important technical features of the operation done here include:

- Spinal or epidural anaesthesia,
- Ensuring adequate size of the mesh,
- Attachment of infero medial corneal of the mesh well overlapping the pubic tubercle,
- Use of less continuous suture to fix the mesh. Tight suturing leads to tissue necrosis and pain,
- Tail is snuggly fitted around the cord

Lichtenstein repair differs, in that, it used,

- Local anesthesia,
- Used a mesh cone for dilated deep inguinal ring

So what we did was, ideally speaking, a modified Lichtenstein repair.

DARNING TECHNIQUE:

The repair if began at the medial end by catching fascia on the pubis pushing through the medial end of inguinal ligament and the remains of the fascia transversalis and then taking good bite through the lowest portion of the medial edge of the rectus sheath and tied. The suture continues laterally in a simple over and over fashion, including, along the lower edge of inguinal ligament, ilio pubic tract, lower part of transversalis fascia. Along the upper

edge, the medial edge of rectus sheath is sutured as far laterally as possible, after which the sutures takes in part of transversalis fascia as well as lower edge of aponeurosis of transervsus Abdominis and internal oblique. Suture bites of the inguinal ligament are staggered *the aim is to bridge the rectus sheath and conjoint tendon to inguinal ligament with minimal or no tension.*

At the lateral end, edges of internal right are picked up and included in the suture to achieve very tight and snug closure of the ring around the cord. This suture is carried laterally beyond the internal ring for 1 to 2 cm with the object of covering the internal ring with the musculoaponeurotic tissue of the arch.

The darning done with 1 prolene starting at the most medial fibers of inguinal ligament where they sweep over the pubic tubercle then are pushed under lateral edge of rectus sheath, just above where they are inguinal ligament below and deep wide bites of the rectus sheath to common. When the rectus sheath no longer is used, the suture passed on to the conjoint tendon. Sutures are continued lateral to internal ring in one direction.

The same sutures changes direction and returns medially as second layer of darn. At the medial end bite is taken on the inguinal ligament at the pubic tubercle and of the lower end of the rectus sheath and tied. Third layer of darning is done in different direction so that there should not be large gaps

through which hernia could recur. The cord is laid on the darn wound closed in a routine fashion.

Salient features:

- Darning was carefully done at medial end where recurrence is common
- Rectus sheath & conjoint tendon was bridged to inguinal ligament without any tension
- Sutures over inguinal ligament staggered
- No gaps between darn was ensured.

Postoperative period:

All the patients were nursed in the general ward. All the patients were given injection diclofenac 50 mg intramuscularly once they reached the ward. Subsequently, in the night, another dose of parental analgesic was given with or without injection pentazocine depending on the severity of pain patients were encouraged oral fluids after four hours from surgery. Form next day onwards they changed on to normal diet and oral analgesics if pain is complained. Patients are encouraged to move around from the very first day of surgery.

All the patients were kept for a minimum of four days in the hospital. No special instruction was given to ward medical or nursing staff regarding the care of the patient. On the discharge patient were advised to return to work and recreational activities at their own pace.

The duration of the operation, intra/post operative complication, number of doses of parental antibiotics, length of hospital stay and postop pain score were recorded.

Follow up:

Patients were advised for review at our out patient department, after one week, one month, six months and one year. At first visit, surgical team assessed each patient.

Subsequent follow up was made by an independent surgeon who had not performed any of the operations. At each time, patients were examined and data collected regarding post operative recovery, time to return to work and to normal life style pain and analgesic requirement.

Presence of complications involving the wound, urinary tract, testicles peripheral nerve and early recurrence. At the first year of follow up special importance to recurrences and contralateral hernia was checked for.

Statistical Analysis:

Representative values from each category were found from the mean value. Chi Square test were used to test the significance between two proportions. **If P Value < 0.05, the difference is considered significant**

Sample size in our study was not sufficient to reliably detect the difference in recurrence rate.

OBSERVATIONS

S no.		Open Tension Free Group	Darning Group
1.	Mean age (20 to 75 yrs)	44.5yrs	47 yrs
2.	Smokers	83%	81%
3.	Mean weight in kegs	59.5	63kgs

4.	**Hernia type**		
	Right Inguinal hernia		
	Direct	12	10
	Indirect	8	8
	Pantaloon	0	0
	Total	20(62.5%)	18(60%)
	Left inguinal hernia		
	Direct	5	4
	Indirect	3	3
	Pantaloon	0	1
	Total	8(25%)	8(26.67%)
5.	Recurrent	0	0
6.	Bilateral	4 (12.5%)	4 (13.33%)
7.	**Grand Total**	32	30

COMPLICATION OF HERNIA SURGERY

S.NO		MESH GROUP	DARNING GROUP	P VALUE
1	Duration of operation	50(minutes) (40-90)	75(minutes) (60-75)	
2.	Visceral injury	0	0	
3.	Vascular injury	0	0	
4	Early Unexplained Return to OT	0	0	
5.	Hematoma	4(12.5%)	3(10%)	0.9278
6.	Infection	3(9%)	2(6.7%)	0.94
7.	Sarcoma	2(6.25%)	1(3.3%)	0.954
8.	Neuralgia	1(3.15%)	3(10%)	0.559
9.	Wound Oozing	4(12.5%)	3(10%)	0.9278
10.	Urinary retention	4(12.5%)	6(5%)	0.6477
11	No. of patients developed early complications	10(31.24%)	11(36.66%)	0.8555

Late Complications

S no.	Complications	Mesh Grp.	Darning Grp.	P Value
1.	Neuralgia	3(11.5%)	5(20.8%)	0.610
2.	Scar tenderness	4(15.4%)	4(16.7%)	0.7929
3.	Recurrence	1(3.8%)	1(4.16%)	0.5064
4.	Total No. Of patients Developed complications	6/26	1/24	0.8667
5.	Drop out rate	18%	20%	

Recovery in community after hernia repair

S.No.		Mesh Grp.	Darning Grp.	P Value
1.	O P analgesics (in Days)	2.31	3	
2.	Return to work (In days)	24(mean) S.D. – 5.05	27(mean) S.D. -4.36	0.0153
3.	Return to normal life style (in weeks)	3.4(mean) S.D. -1.64	4(mean) S.D. – 0.63	0.06532

Early post – operative recovery after hernia repair

S.No.		Mesh Grp.	Darning Grp.	P Value (< 0.05)
1.	Post operative hospital stay (<4 days)	82%	74%	0.6497
2.	Pain score			
	At 24 hours	3.06 (mean)	3.18 (mean)	0.7678 (X^2-0.53)
	At 72 hours	2.28	2.40	0.5126 (X^2-2.30)
	After one week	1.69	1.67	0.73 (X^2-0.6932)
3.	Parental analgesics in hospital (>2 days)	35%	33.3%	0.8990

Pain scores

Score 1: Mild, only on walking or on deep pressure

Score 2: Moderate, pain even at change of posture but not at rest

Score 3: Severe, Present even at least.

Score 4: Unbearable

DISCUSSION

Various methods of open repair using either tissue suture or reinforcement with prosthesis have been championed for years often byway of large series from a single institution. Laparoscopic and Endoscopic techniques which have evolved during the past decade, have been employed more recently, but not without controversies or conflicting results.

Observations of our study:

- Type and side of hernia was well matched between the two Groups.

- Mean weight and smoking status also matched.

- Though there was not much statistically significant difference in early and late complications between the two groups (p=0.8557, p=0.86667 respectively), *the mesh group had slightly more early complication compared to darning technique which had more late complication.*

- No much difference in severity of pain at 24, 72 hours, after I week. Analgesic requirement both as in and out patient had No much statistically significant difference.

- Return to normal lifestyle was the same in both the groups.

- But the duration of operation was more in case of darning group.

- Return to work was faster in mesh group

- In this study there was drop out of 5% at six months follow up and up to 20% during one year follow up.

- **With small sample size, lesser duration of follow up, statistically significant recurrence rate could not be made out.**

British hernia center reported results of 3175 inguinal hernia repairs. A total of 97% were men and age range was 15 to 92 years. 17% were older than 70 years – 2% developed hematoma 1.3% developed wound infection 1% developed testicular swelling all of which settled, 1% developed post op pain for more than 2 months. Period return to work was 8 days. **In our study complications were more and return to work was late.**

- In another study by **Kux and colleagues** confined the study to patients aged more than 60 years and those at high risk of recurrence compared 107 Shouldice's with 102 Lichtenstein mesh repair. Post op pain was significantly reduced in mesh group although it was felt that both type of repair, produced good results when performed correctly.
- The study of **Jane and colleagues** over 9 years in more than 800 hernias concluded that open mesh repair yielded the lowest recurrence rate without increasing infection rate, other complications or length of hospital stay. Our study showed similar results.
- **Maloney** in 1948 and 10 years later reported a technique using nylon stutures to weave or darn the groin floor to repair hernia with tension free lattice, reported a recurrence

rate less than 1% in 253 hernia repairs followed for more than five years.

- **Callum and colleagues** reported their results with nylon darn techniques in 1974 with a recurrence rate of 7.5% in 186 repairs with follow up of 5 to 12 years.
- **Abrahamson and Eldar** performed this repair on 780 patients over a 10-year period and reported, in 1988 a recurrence rate of 1.8% with minimum follow up of three years.Our study reported more recurrence rate compared to western studies.
- **Koukourou and colleagues** in their study of prospective randomized trail polypropylene mesh with nylon darn in inguinal hernia repair (BJS 2001, 88, 831-934) reported that there was no added advantage of mesh repair over nylon darn with respect to early post op pain, complications or return to normal life rate of early recurrence was identical. The length of time to full recovery was on average 5 weeks for both groups. The proposed advantage of mesh, in which more rapid recovery was not supported in this trial.

- Our study had more early and late complications and prolonged hospital stay compared to the original trial in both groups.
- The severity of pain was the same in both groups
- Return to work was earlier when compared to the original trial in the mesh group.

CONCLUSION

Despite short follow up periods, the outstanding feature of all open tension free repair is the exceedingly low recurrence rate and low postoperative pain now being widely reported. Many of these are large series from large specialized centre. It has been advised that all the centers particularly training centers use mesh because of low recurrence rate. However, judging the success of hernia solely in terms of recurrence rate is too limiting. The factors needed to be taken into account when assessing the choice of operation as suggested by RUTKOW is,

1. Reproducibility by junior staff
2. Likelihood and severity of possible complications
3. Post operative discomfort
4. Time to return to work and daily activity
5. Financial cost involved

- Taking all these into account, the present results of our study conclude 1) The importance of training and supervision, no matter which technique is employed.

  2) The mesh group had slightly more early complication compared to darning technique which had more late complication

  3) No much difference in post operative pain, both group

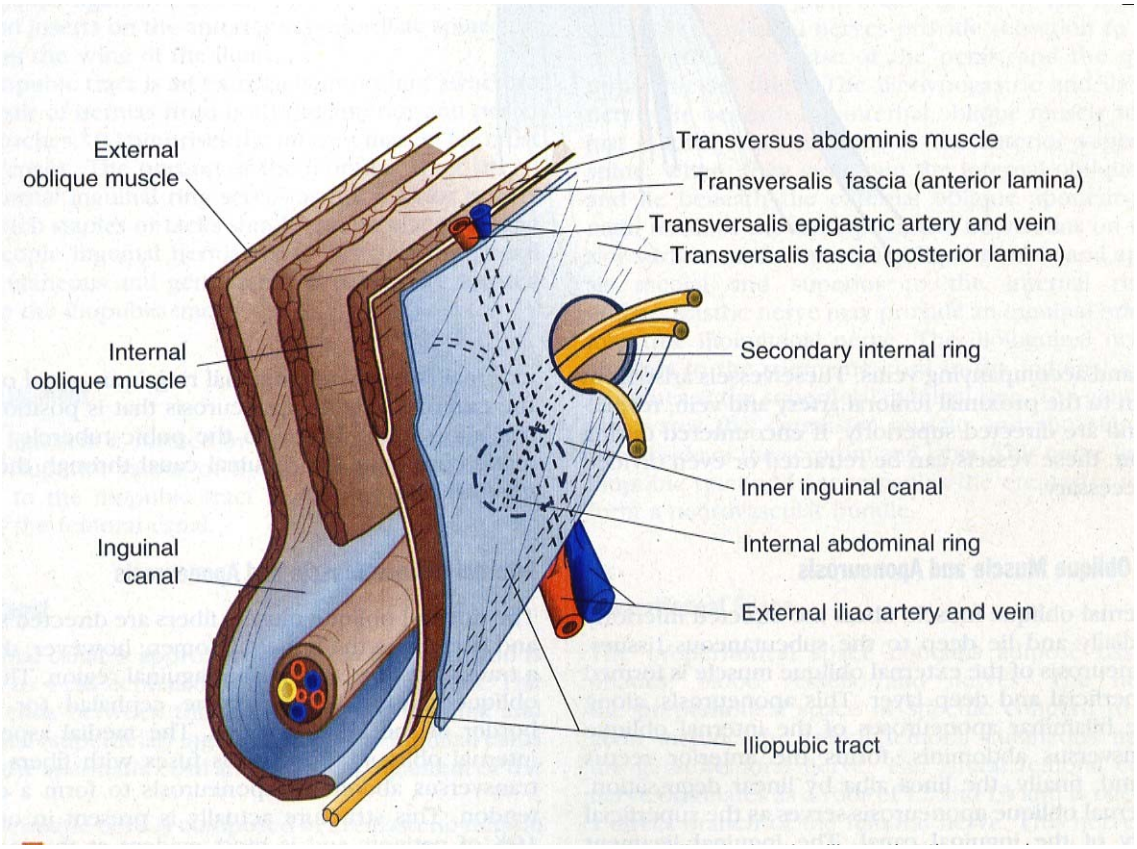
4) Return to work was faster in mesh group than darning

5) Poor socio – economic status of our patients who therefore are unable to afford the mesh and lack of adherence to Lichtenstein principle by the surgeons makes darning technique an acceptable modality of strengthening posterior wall of inguinal canal in hernia repair as both achieve similar results.

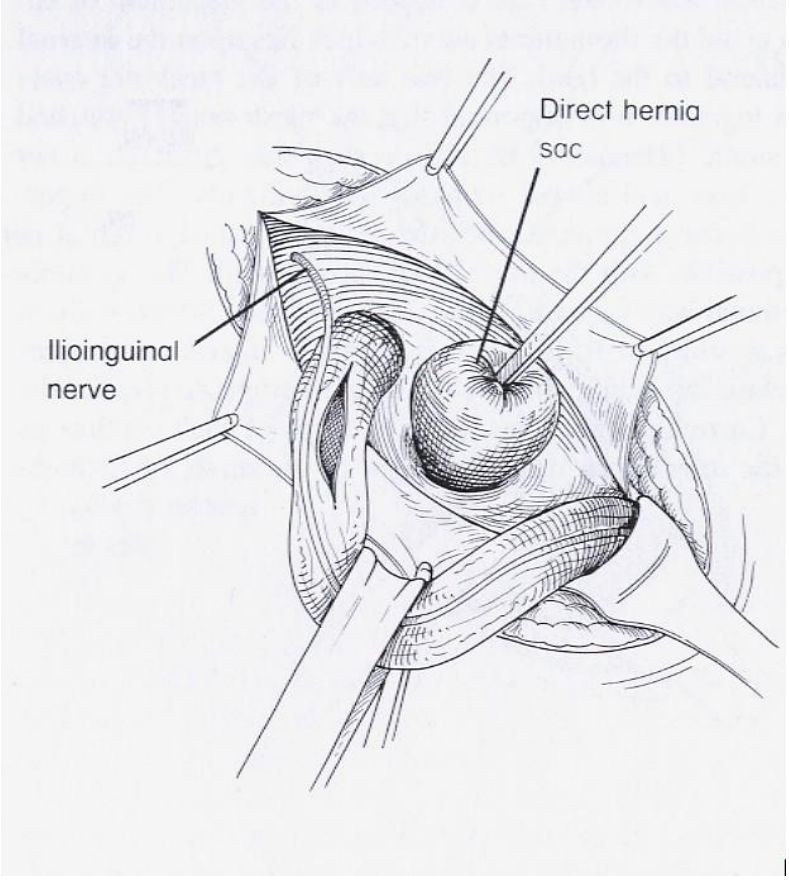
6) With small sample , lesser duration of follow up, statically significant recurrence rate count not be made out .

- Smaller sample size and shorter follow up were the drawbacks of our study. Hence further studies are required to conclusively prove our results.

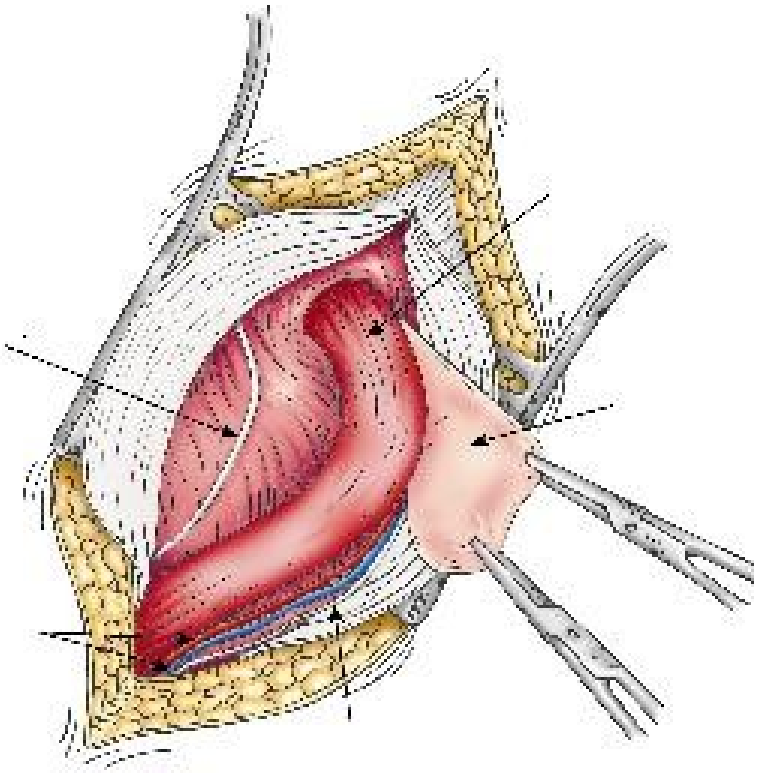
ANATOMY OF INGUINAL CANAL



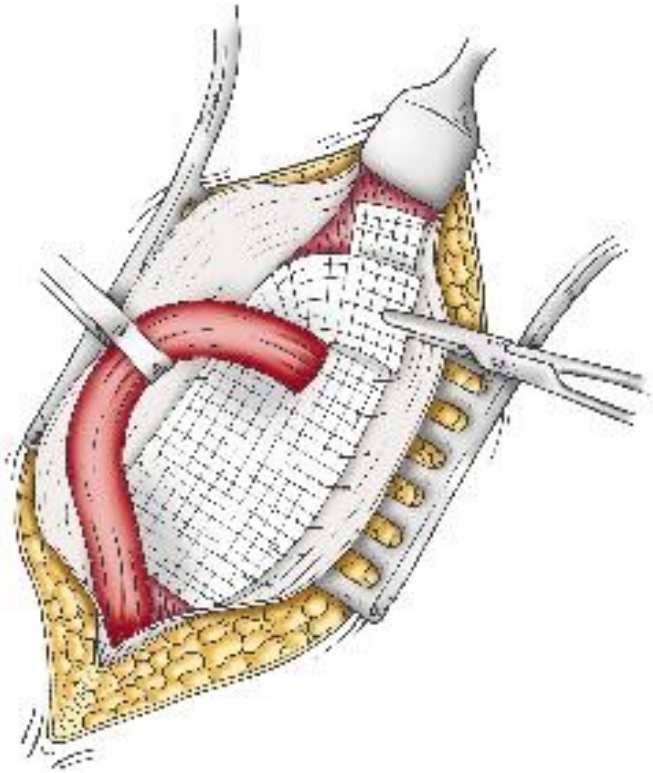
DIRECT INGUINAL HERNIA



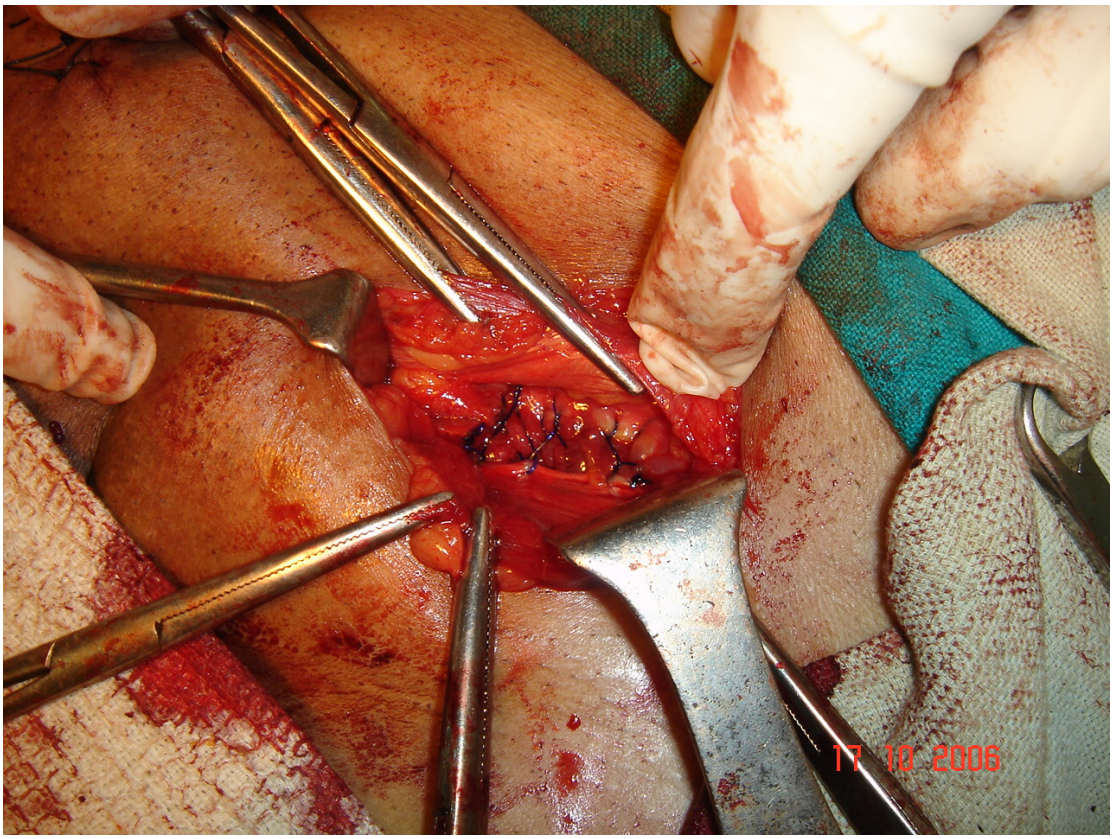
INDIRECT INGUINAL HERNIA
(SEPARATION OF SAC)



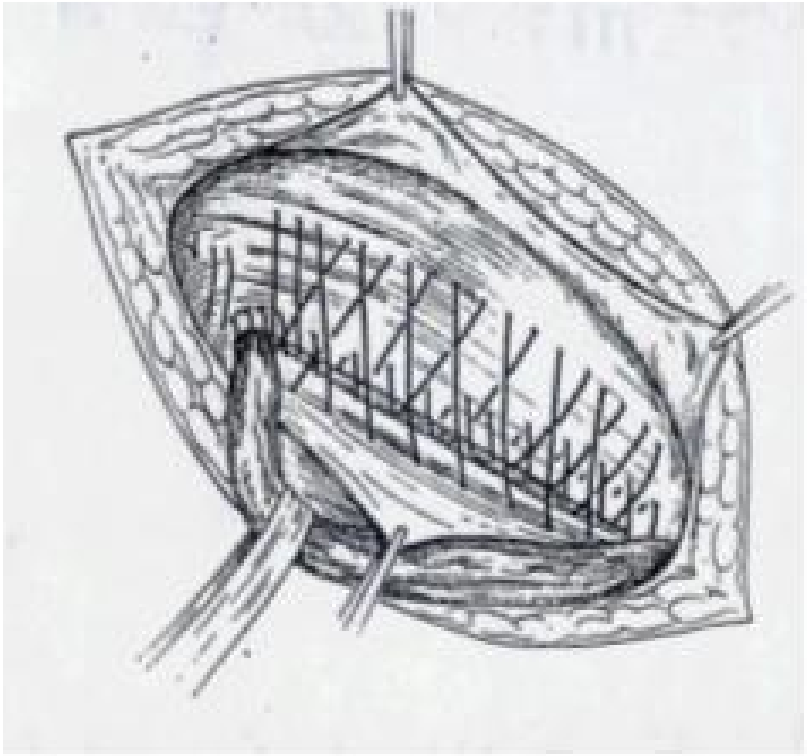
ONLAY MESH REPAIRED



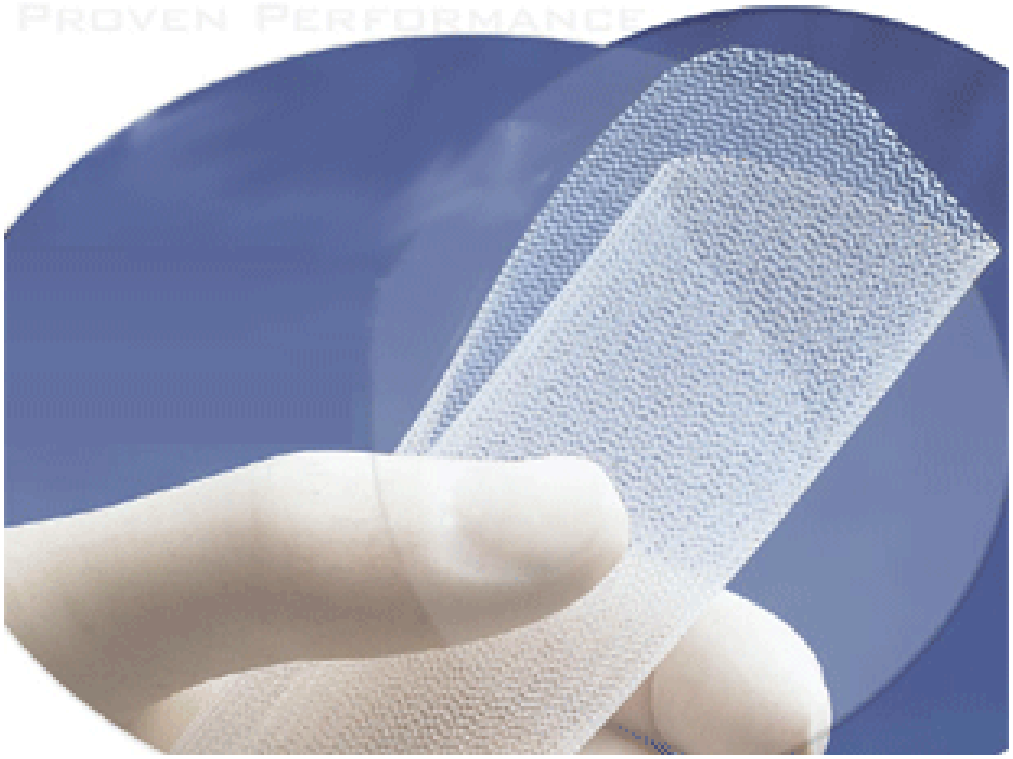
DARNING



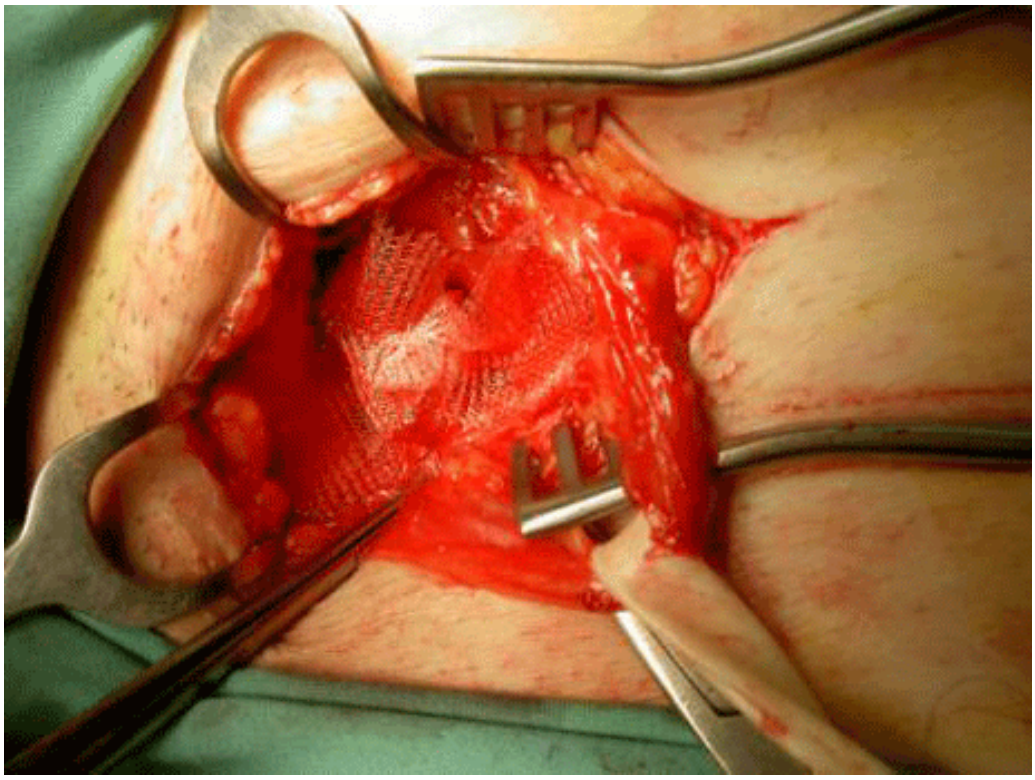
THE COMPLETED DARN



MESH



COMPLETED MESH REPAIR



PROFORMA

Name : Age: Sex:

Address : Wt: IP NO:

Clinical Diagnosis: Unilateral (RT / LT.) or Bilateral

Direct / Indirect / Pantaloon

Co – morbid conditions

Diabetes / Hypertension / Tuberculosis / Obesity / Others

Smoker / non- Smoker

Anesthesia: GA / RA / Local

Procedure Done:

Daring / Tension – Free Mesh Repair

Post – Operative Complications:

Early – Hematoma / Infection / Neuralgia / Seroma/

Wound Oozing / Urinary retention

Late – Neuralgia / Scar Tenderness / Recurrence

Analgesic Requirement:

In hospital :

As out – Patient :

Return to work (in days):

Return to Normal life style (in weeks):

Follow-up

First Week

First Month

One year

LEVEL OF PAIN	NUMBER OF PATIENTS	
	Darning group	**Mesh group**
Level - 1	0	0
Level - 2	3	5
Level - 3	19	20
Level - 4	8	7

LEVEL OF PAIN	NUMBER OF PATIENTS	
	Darning group	**Mesh group**
Level - 1	1	4
Level - 2	19	17
Level - 3	7	9
Level - 4	3	2

LEVEL OF PAIN	NUMBER OF PATIENTS	
	Darning group	**Mesh group**
Level - 1	13	15
Level - 2	14	12
Level - 3	3	5
Level - 4	0	0

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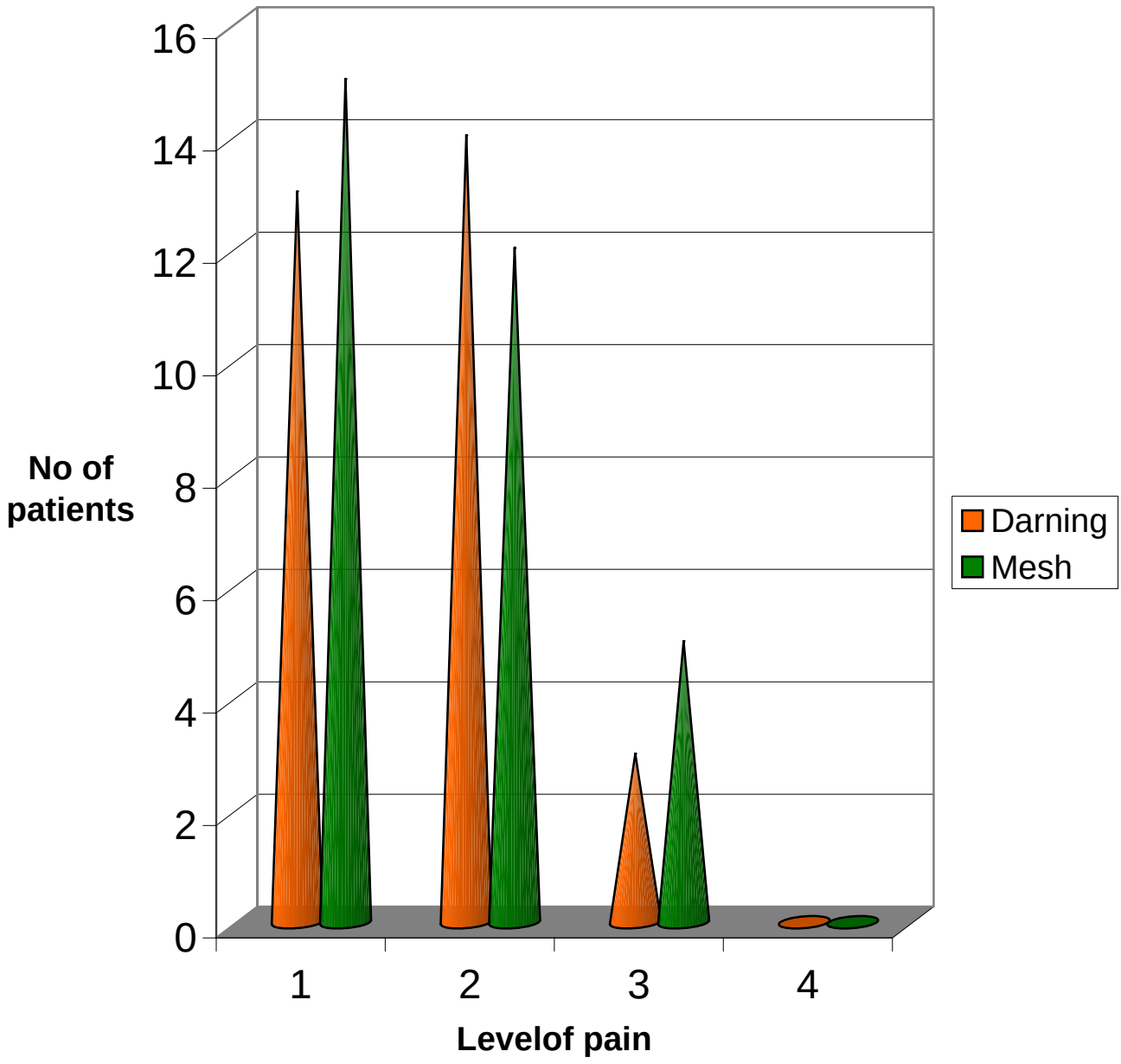
Pain scores after inguinal Hernia Repair with Darning or Mesh after one week



OPEN TENSION FREE MESH REPAIR

MASTER CHART

					Early complications						Late complication			Pain score		
S.NO	NAME	AGE	I.P.NO	SIDE	H	I	S	N	W	R	N	Sc	Rec	24hr	48 hr	1 week
1	BALASWAMY	72	244046	R						*				3	2	2
2	BOOMINATHAN	24	245809	R										3	1	1
3	SUBRAMANI	50	248588	L	*	*	*			*				3	3	3
4	KARUPPANAN	33	251995	R										3	2	1
5	MANIMARAN	44	259817	R										2	2	2
6	PONNAMBALAM	66	245822	R										3	2	1
7	RAJENDRAN	53	248572	L		*		*	*		*			4	4	3
8	MALAICHAMY	26	253548	L										3	2	1
9	SAKTHIVEL	39	255298	R										3	1	2
10	MOOKAYAN	70	281734	R										2	2	1
11	KILAVAN	72	278097	B/L	*					*		*		4	3	3
12	PONNUSAMY	57	285913	R										2	2	2
13	THAMILSELVAN	38	319125	R							*			4	3	2
14	KALEESWARAN	27	322244	R	*									4	2	1

15	RAJA	41	279945	L										2	1	1
16	BALU	36	281656	B/L		*	*			*		*		4	4	3
17	ALAGAR	29	281662	R										2	2	1
18	RANJITHKUMAR	24	283066	L										4	2	2
19	ASAITHAMBI	37	284139	L					*					3	3	2
20	VELMANI	68	284192	R										3	2	1
21	BEERMOIDEEN	46	319027	R										3	2	2
22	SIVAPANDI	33	319053	R										2	3	2
23	DURAIPANDI	35	319064	R										3	2	1
24	KESAVAN	37	323403	R										3	2	1
25	BASKARAN	28	324444	L							*	*		3	3	3
26	SANTHOSHKUM/	54	322304	R	*	*								3	2	1
27	SUNDARARAJ	59	322316	R										4	2	1
28	MOORTHY	42	325433	L										4	3	2
29	RAMDOSS	28	325532	B/L						*				3	3	2
30	SHANMAYAN	68	326581	R										3	2	1
31	PITCHAIMUTHU	63	342592	R										3	1	1
32	SARAVANAN	28	343757	B/L					*					3	2	2

H. Hematoma I. Infection S- Seroma N- Neuralgia W- Wound oozing

R- Urinary retension Sc- Scar tendernes Rec- Recurence P- Pantaloon